

Further Updates to the Tropical Cyclone Logistic Guidance for Genesis (TCLOGG)

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Project Background

- TC genesis forecasting has been added as a key operational priority.
- Global NWP guidance has advanced in terms of resolution and physics. The biases in the raw NWP output can be exploited by developing calibrated TC genesis guidance products.
- This guidance applies logistic regression to key variables from global NWP output to produce well-calibrated probabilities for TC formation.

Project Background (Continued)

- The logistic regression approach is applied to GFS, UKMET, CMC, NAVGEM, and ECMWF real-time output, and has provided well-calibrated guidance for TC genesis at 48 h and 120 h for the central & eastern Pacific and north Atlantic basins to aid the NHC/CPHC Tropical Weather Outlook (TWO) products:

<http://moe.met.fsu.edu/modelgen> and <http://moe.met.fsu.edu/modelgenec>

- However, there has been considerable evolution in the raw global NWP guidance available over the past five years that, along with additional NHC goals and improved local techniques, have warranted further modifications to the TCLOGG guidance.

Major current project (JHT cycle 2019-2022) goals

- Extend genesis guidance from 2/5-days to 7-days. (COMPLETED)
- Develop a most likely time of genesis forecast through comparison of the timing of TC genesis within the individual models. (COMPLETED)
- Expand the TCLOGG approach to use the GEFS Reforecast output to make use of ensemble data and the longer developmental dataset. (ONGOING)

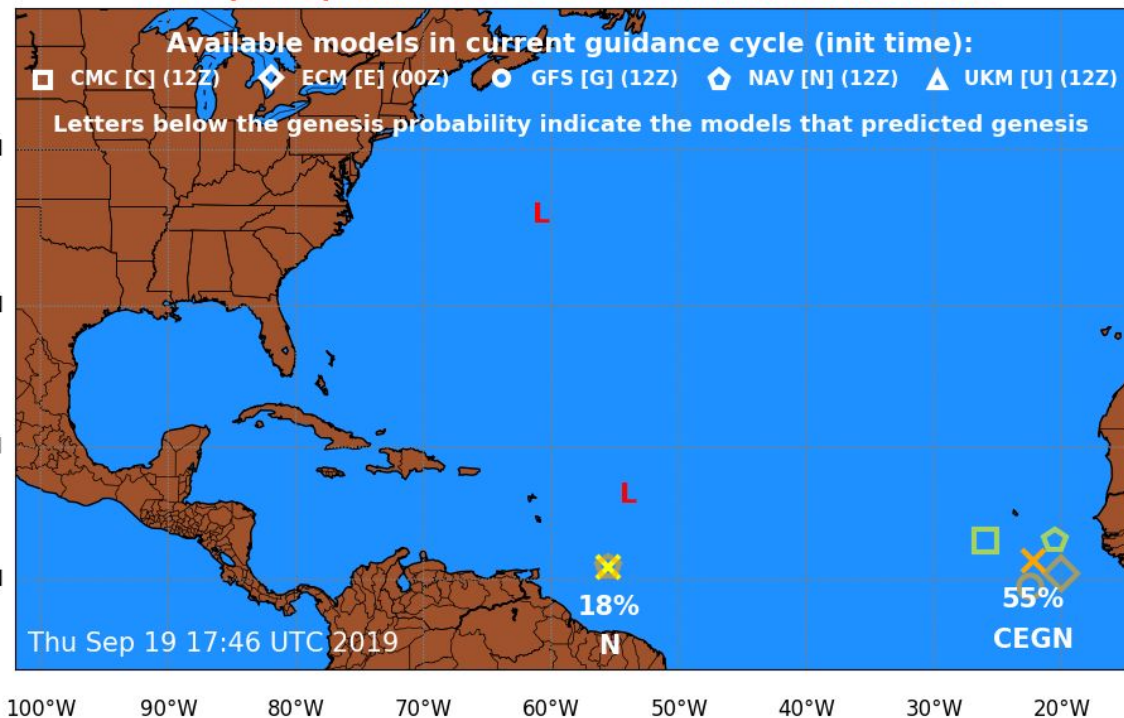
TCLOGG has been run by the JHT facilitator on an NHC workstation since 2019.

FSU version

Experimental 0-120 h TC genesis probability

2019-09-19 12Z consensus guidance

Not a public product. Do NOT share with unauthorized users.



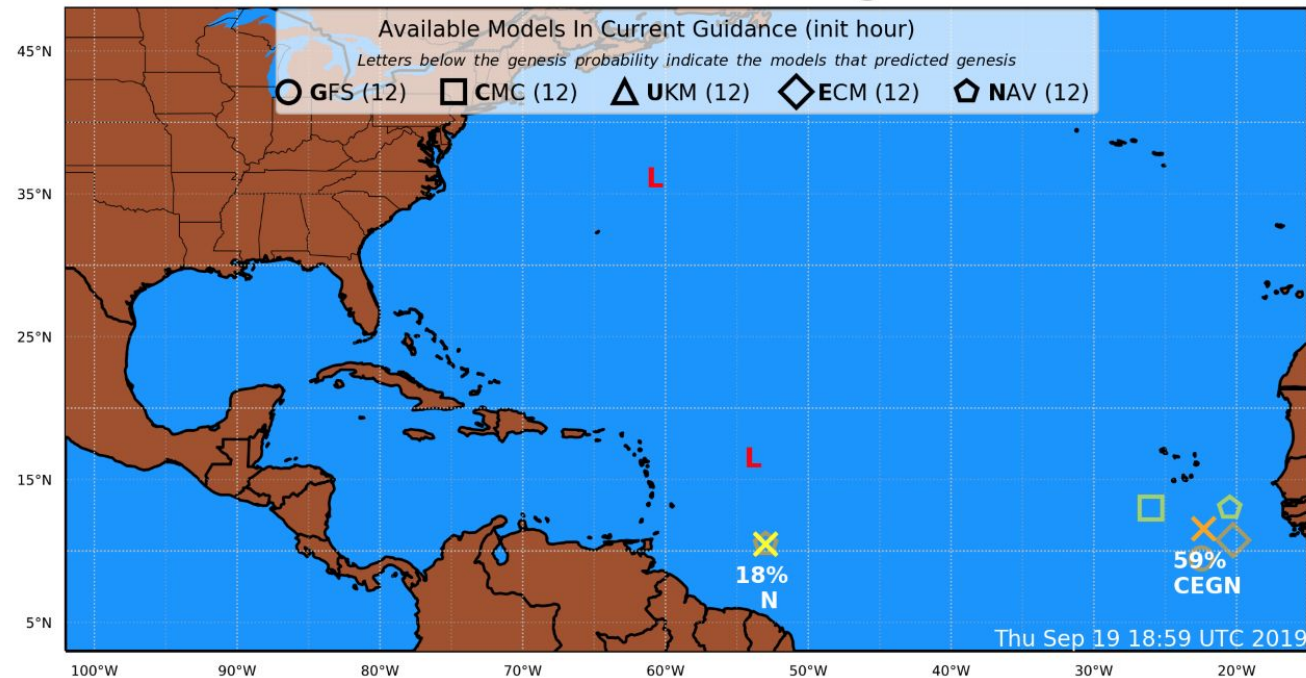
<http://moe.met.fsu.edu/modelgenec>

Uses data from GFS v15.1

NHC version

Experimental 0-120h TC genesis probability

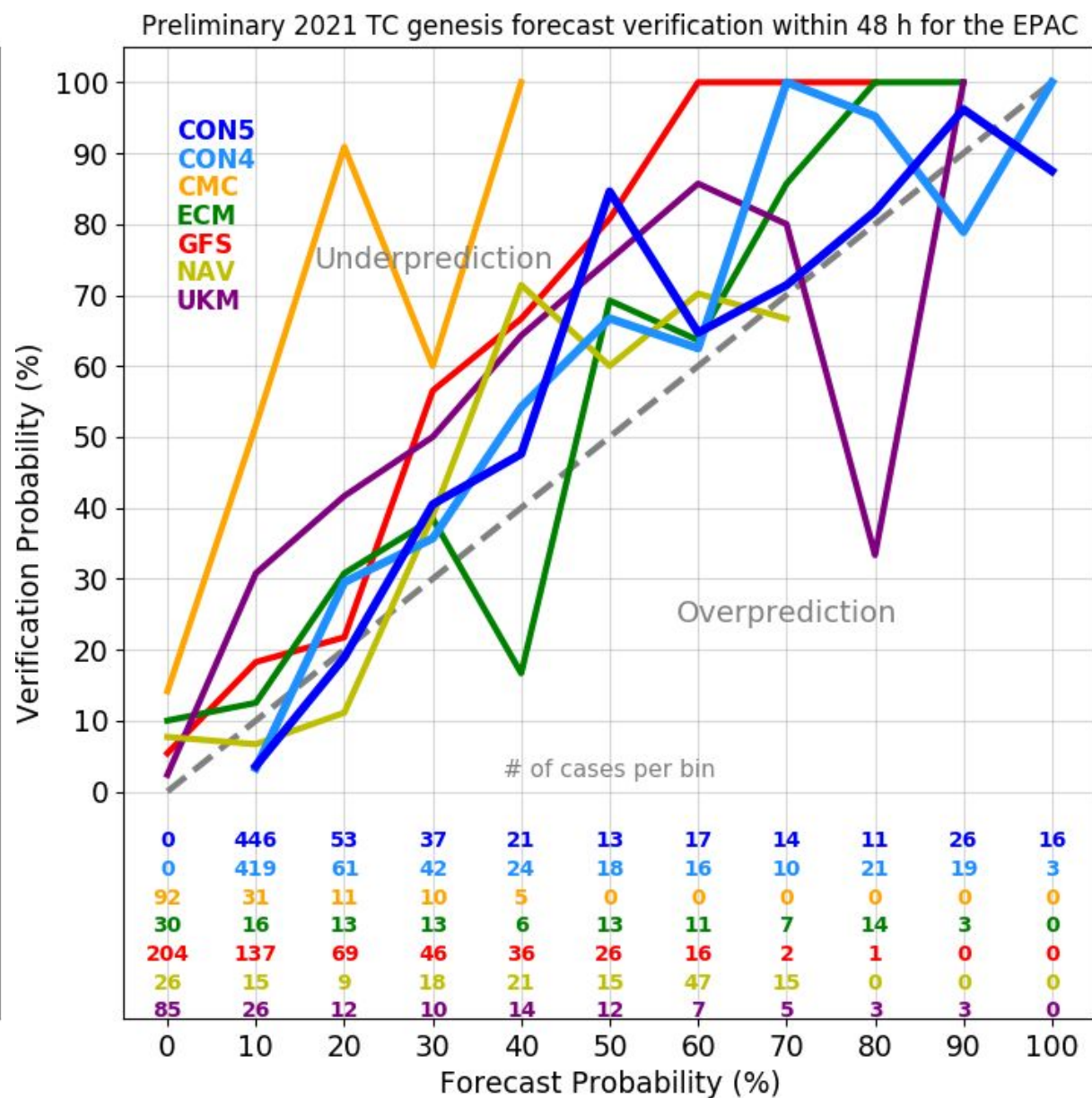
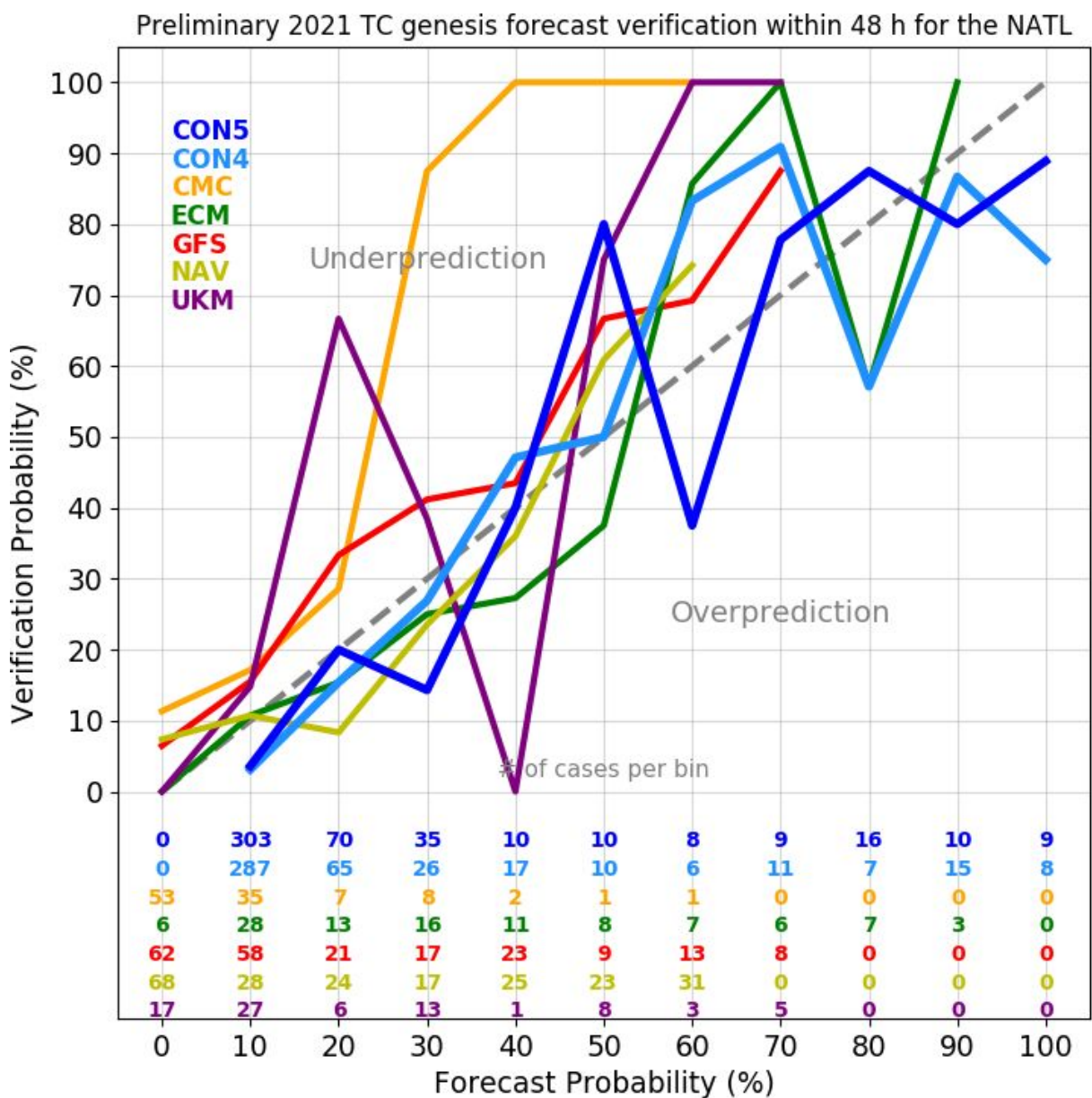
19-09-19 12Z consensus guidance



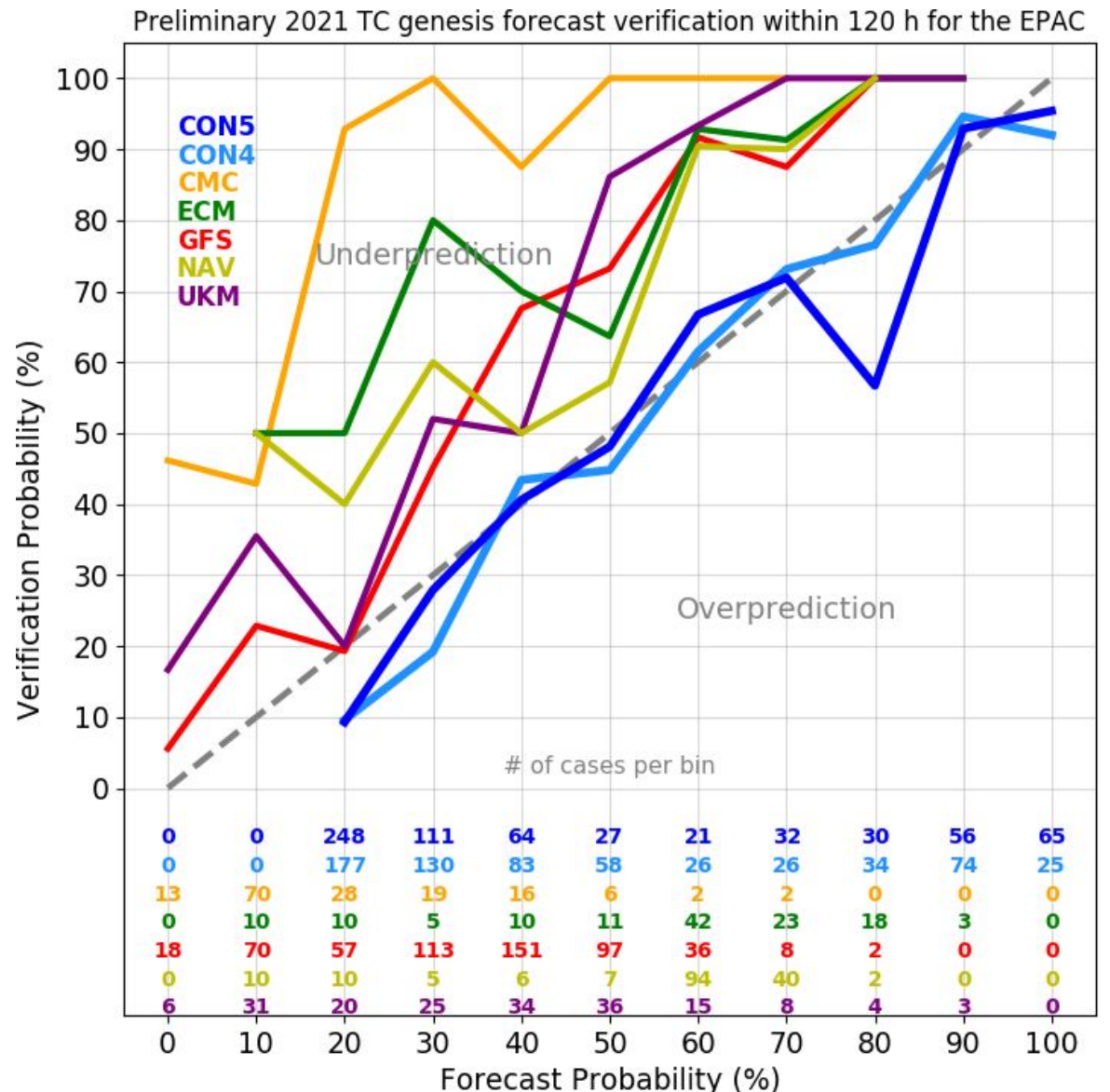
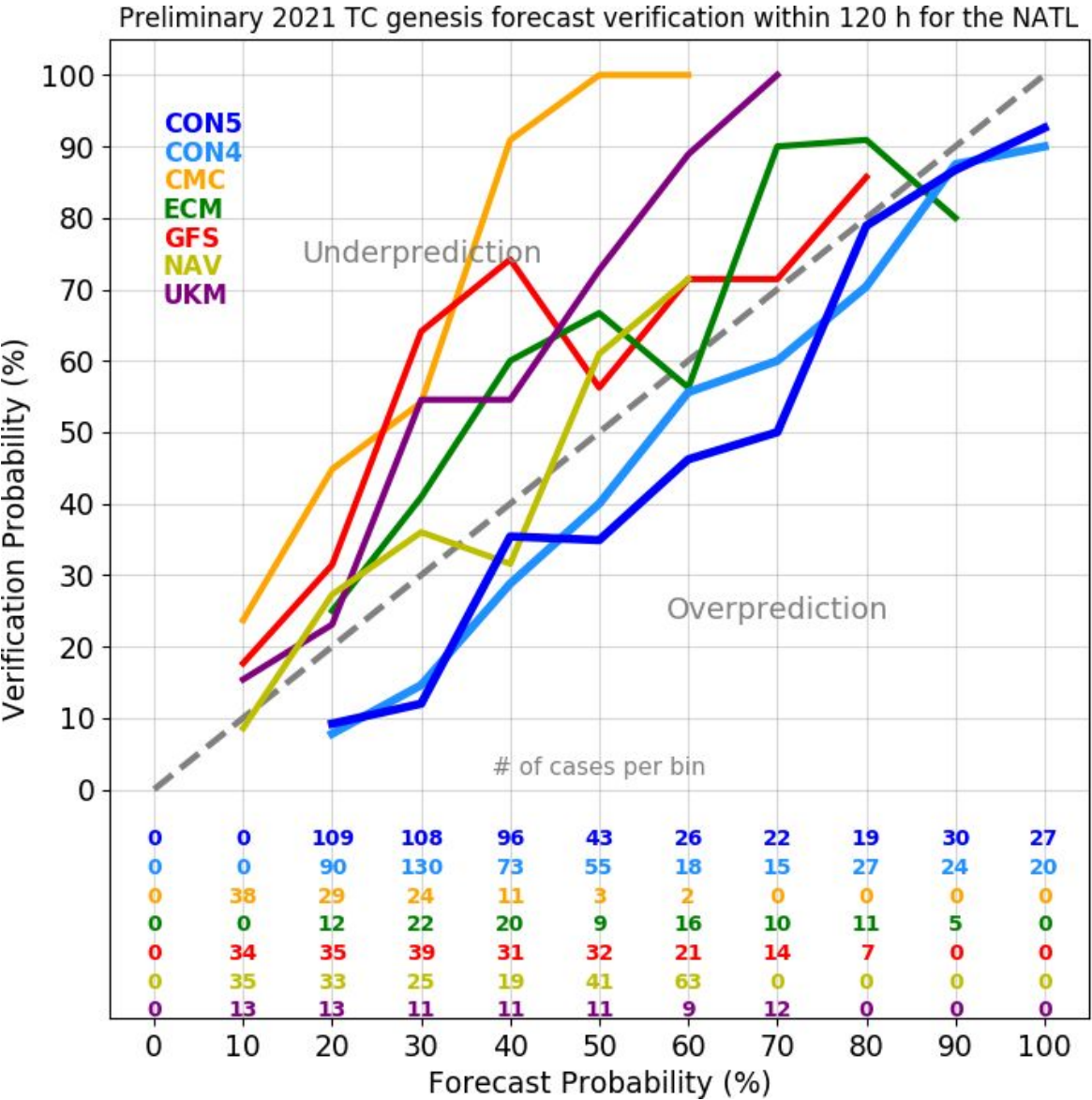
Guidance products with ECMWF output included are not available to the public and can only be shared with JHT project personnel (including NHC) per the licensing agreement.

Guidance products without ECMWF output are available to the general public at <http://moe.met.fsu.edu/modelgen>

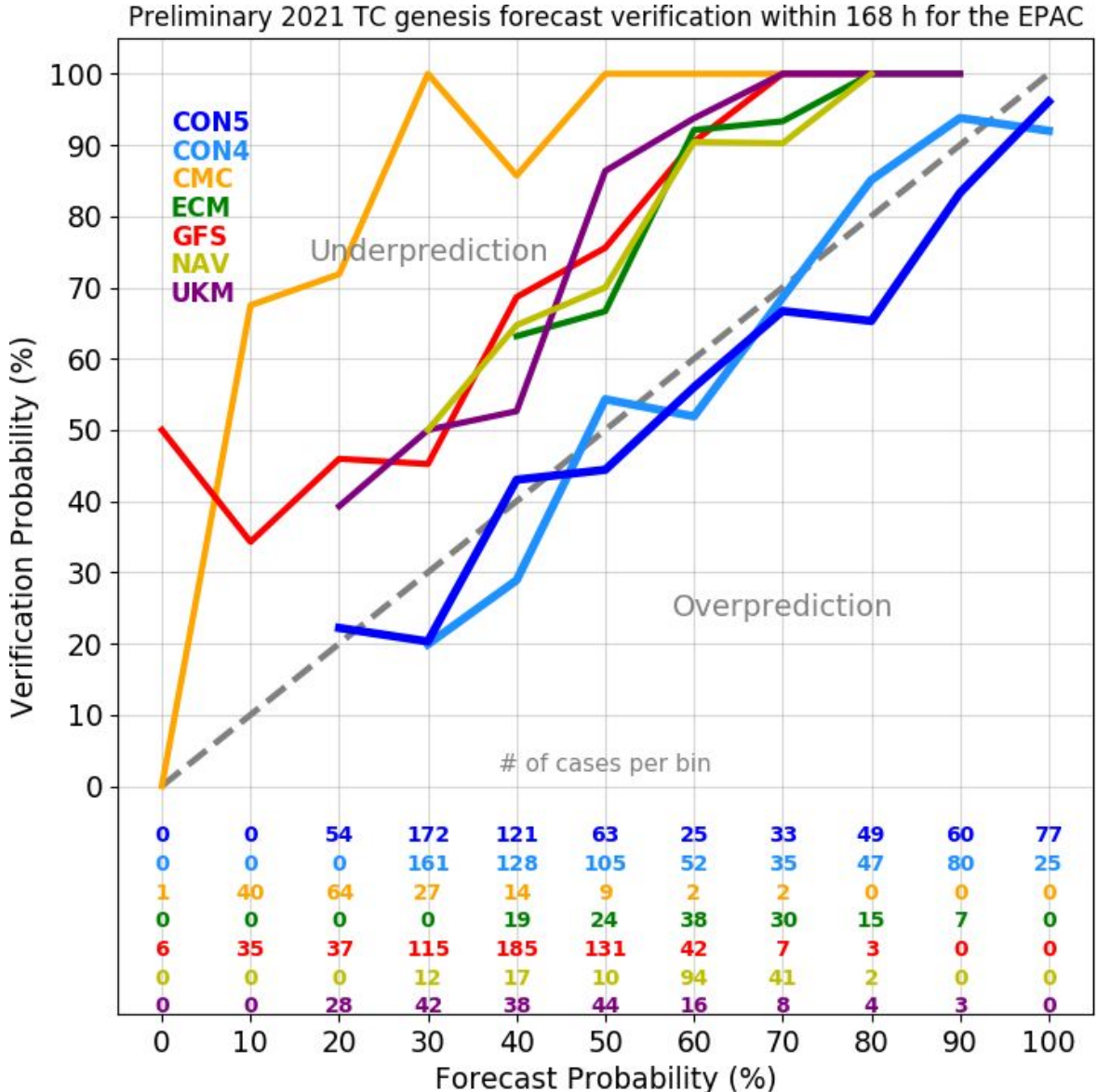
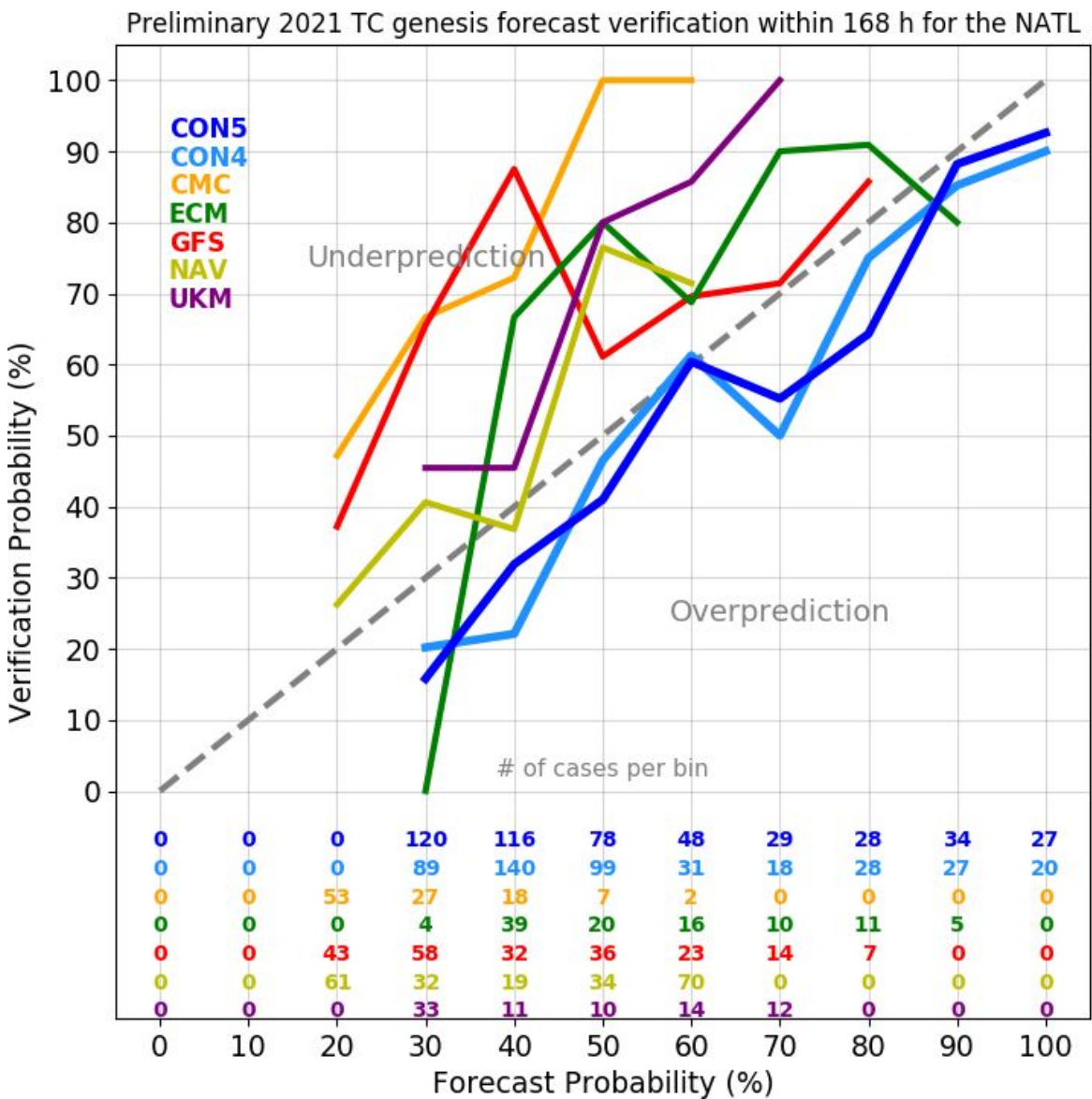
0-48 h guidance overall was reasonably well calibrated, especially for the 4 and 5 model consensus. CMC continues a low bias due to model upgrade in 2019.



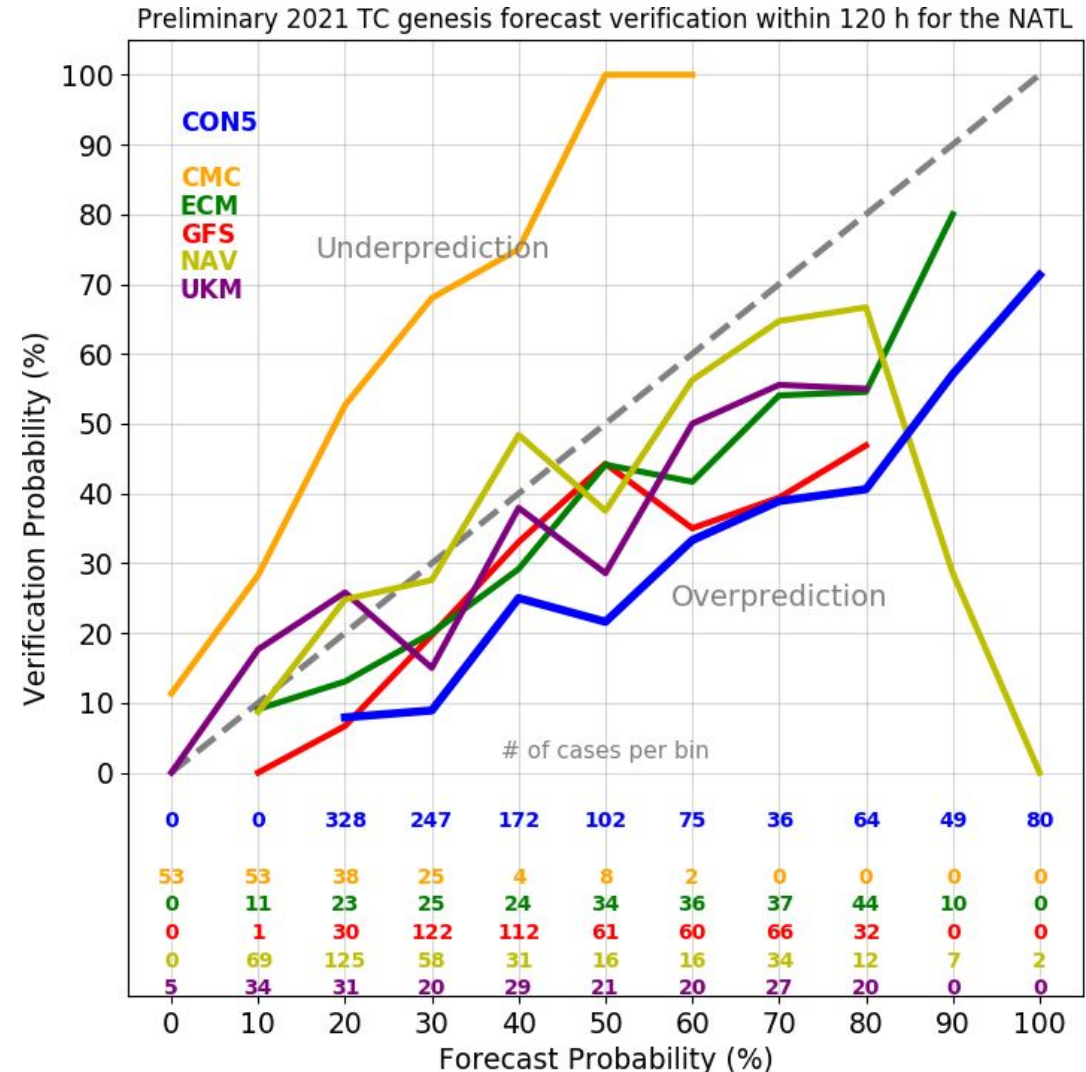
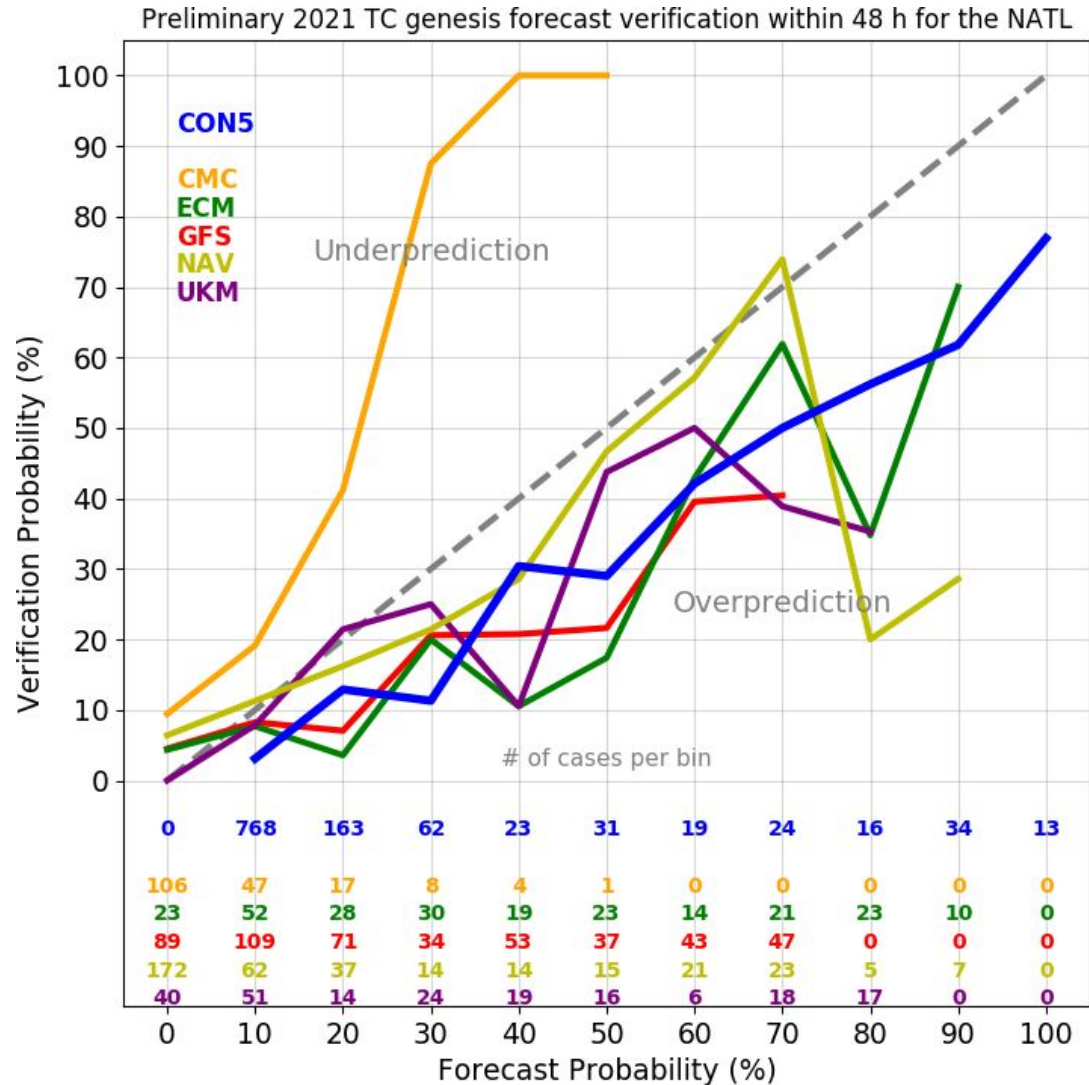
0-120h verification had overall a low bias, in particular in the EPAC. The four and five-model consensus was well-calibrated, in particular in the EPAC.



0-168h verification similar to 120h, with the most noteworthy signal being the consensus guidance in both basins very successfully removed the significant individual model biases.



Preliminary verification of using the experimental tracker that uses a latitude-dependent thickness threshold shows a high bias of genesis probability overall, likely due to a degradation of performance on deep tropical cases to improve performance on higher latitude cases.



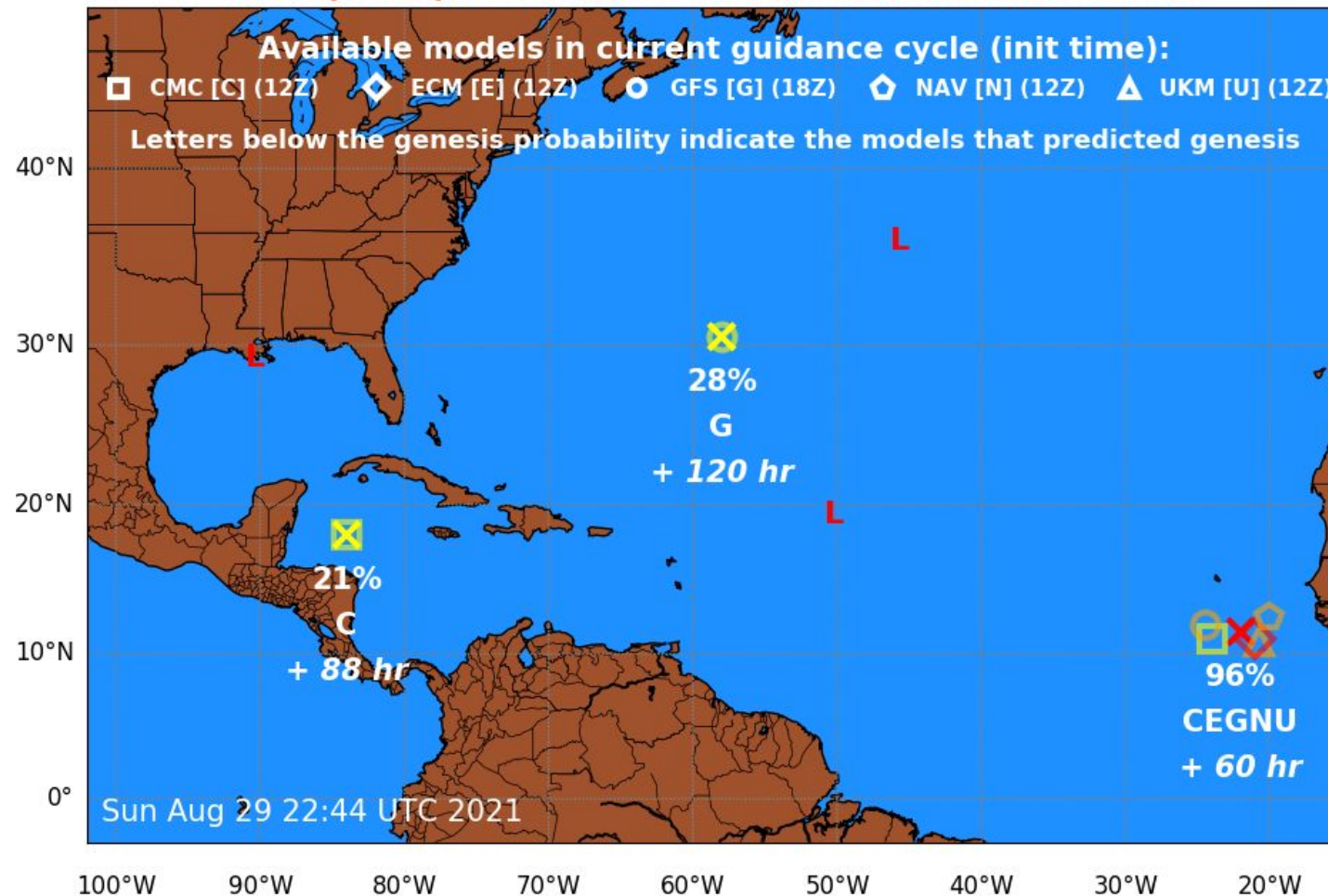
The Most Likely Time of Genesis (MLTG) is now implemented on the webpage products.

Note: Only some models warranted a timing correction based upon the statistics.

Experimental 0-120 h TC genesis probability

2021-08-29 18Z consensus guidance

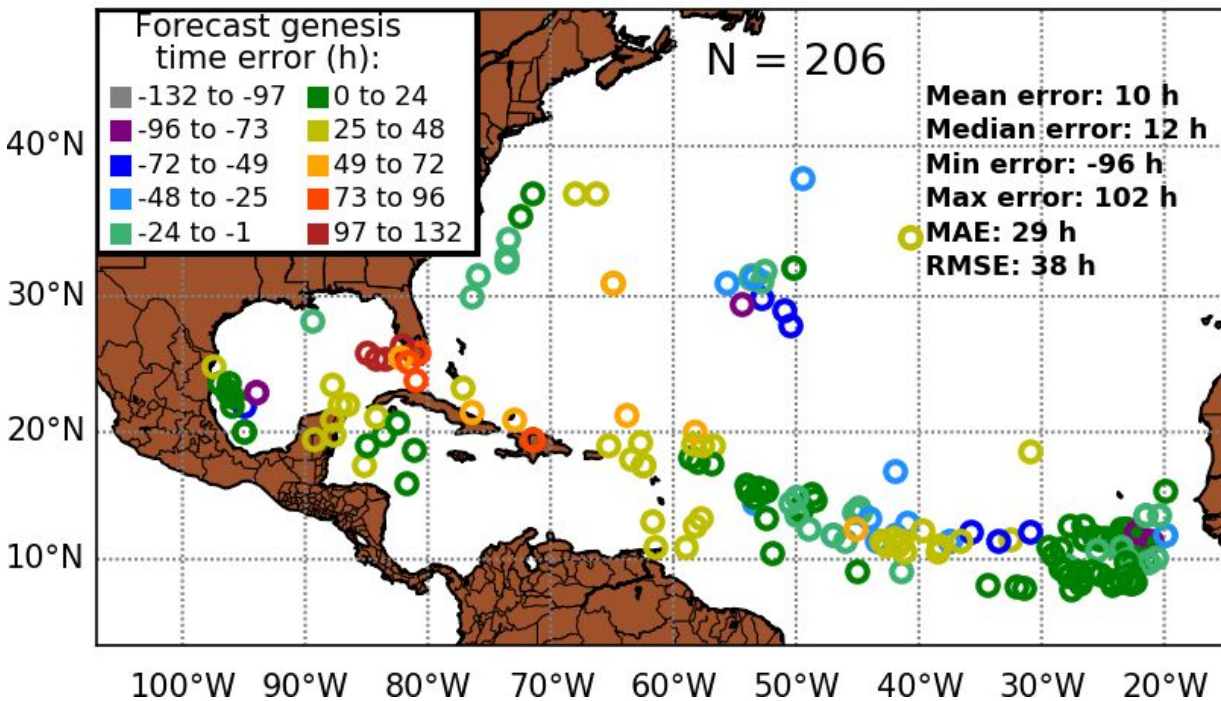
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Verification of the MLTG shows impressively low mean and median timing error for both basins, although variance about that mean is considerable in both basins.

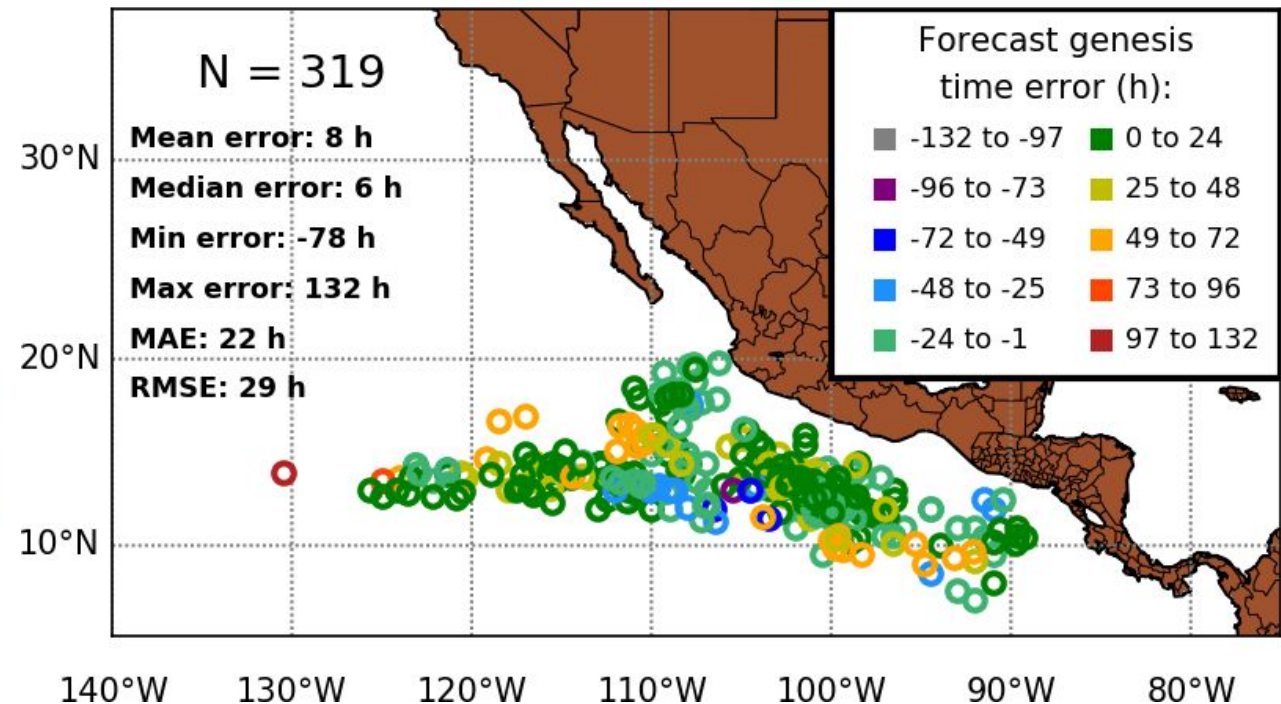
Preliminary TC genesis forecast timing verification

2021 CON based 168 hour genesis forecast hit events



Preliminary TC genesis forecast timing verification

2021 CON based 168 hour genesis forecast hit events



Final stage of research development: GEFSR/GEFS-based probabilities

- TCLOGG development thus far has used an ensemble of deterministic models. In Y3, probabilistic guidance based on the GEFS Reforecast (GEFSR) is in development.
- Since there is not a lengthy multi-year archive currently available for the 30-member GEFS itself, we are developing regression equations using the GEFSR (a 5-member 00Z ensemble, except 11-members on Wednesday).
- Running the tracker on the GEFSR mean fields yielded few useful results due to smoothed out fields.
- Thus, we are currently quantifying the statistics from the GEFSR tracker as applied to each of the 5 ensemble members. These verified historical forecasts will serve as the training dataset for the regression equations that will be applied to the operational GEFS in real time.

Updated Readiness Levels (RLs) in consultation with JHT POCs:

Component	Project Start RL	Current RL	Status
Existing TCLOGG components	6	7/8	Implemented by Alan Brammer at NHC
GFS Switch PRMSL to MSLET	6	7/8	Implemented by Alan Brammer at NHC
Seven-day genesis guidance	6	7/8	Implemented by Alan Brammer at NHC
Separation of guidance into 0-48 and 54-120 h equations.	5	7/8	Implemented by Alan Brammer at NHC
Most likely time of genesis	3	7	Code sent to NHC for testing
Guidance based on GEFS	3	5	Development continuing

Remaining Plans

- Re-calibrate all regression equations using 2021 best-track results
- Attend and present latest results at the AMS Tropical Conference in May 2022
- Request no-cost time extension through June 2023 for travel to 2022/2023 conferences due to prior COVID impacts on travel
- Further develop and independently test the GEFSR-based probabilistic genesis equations

Extra slides

Preliminary 2021 TC genesis forecast verification within 168 h for the NATL

